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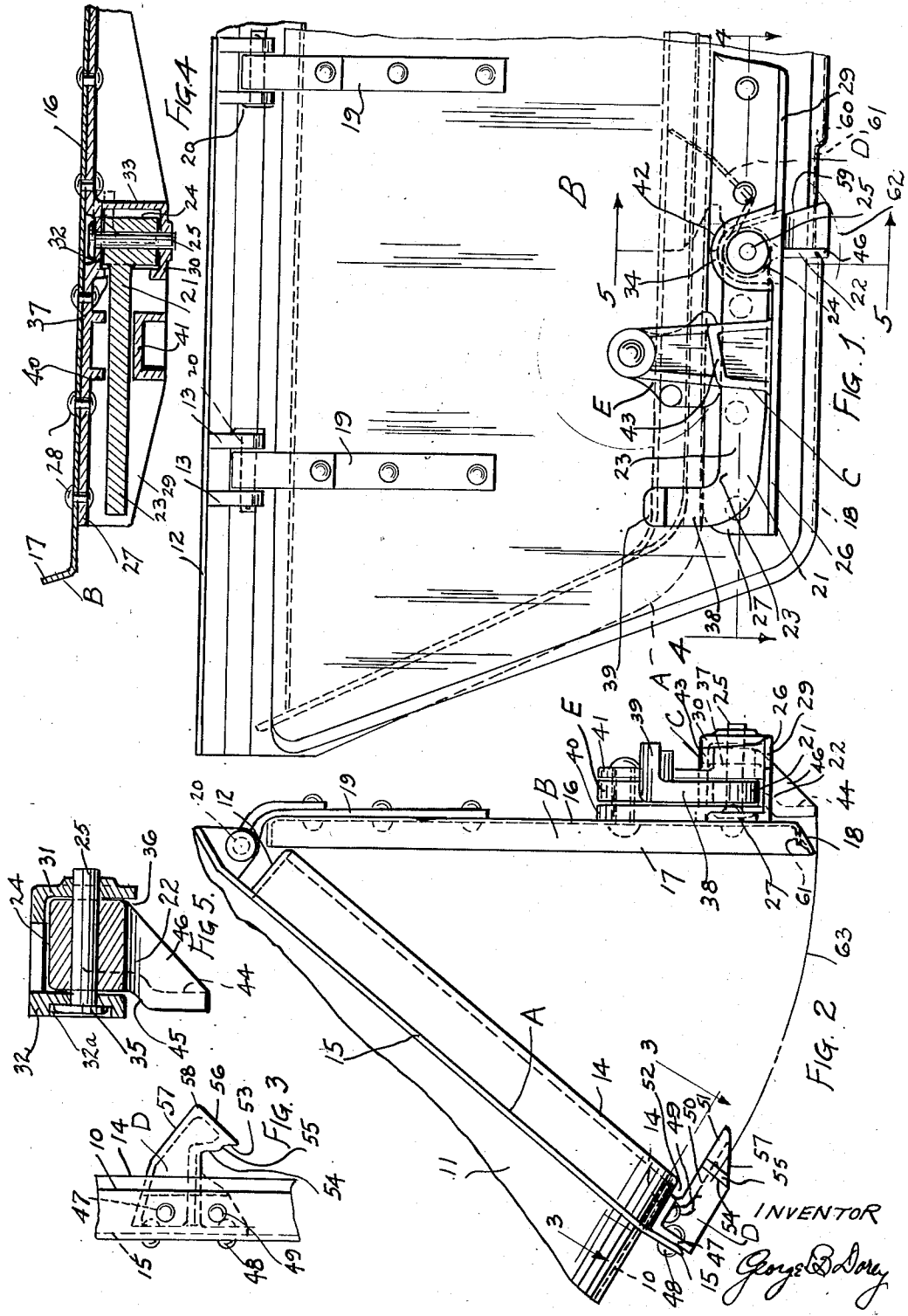
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HOPPER CAR DOOR LATCHING MEANS

Filed May 15, 1947

2 SHEETS—SHEET 1



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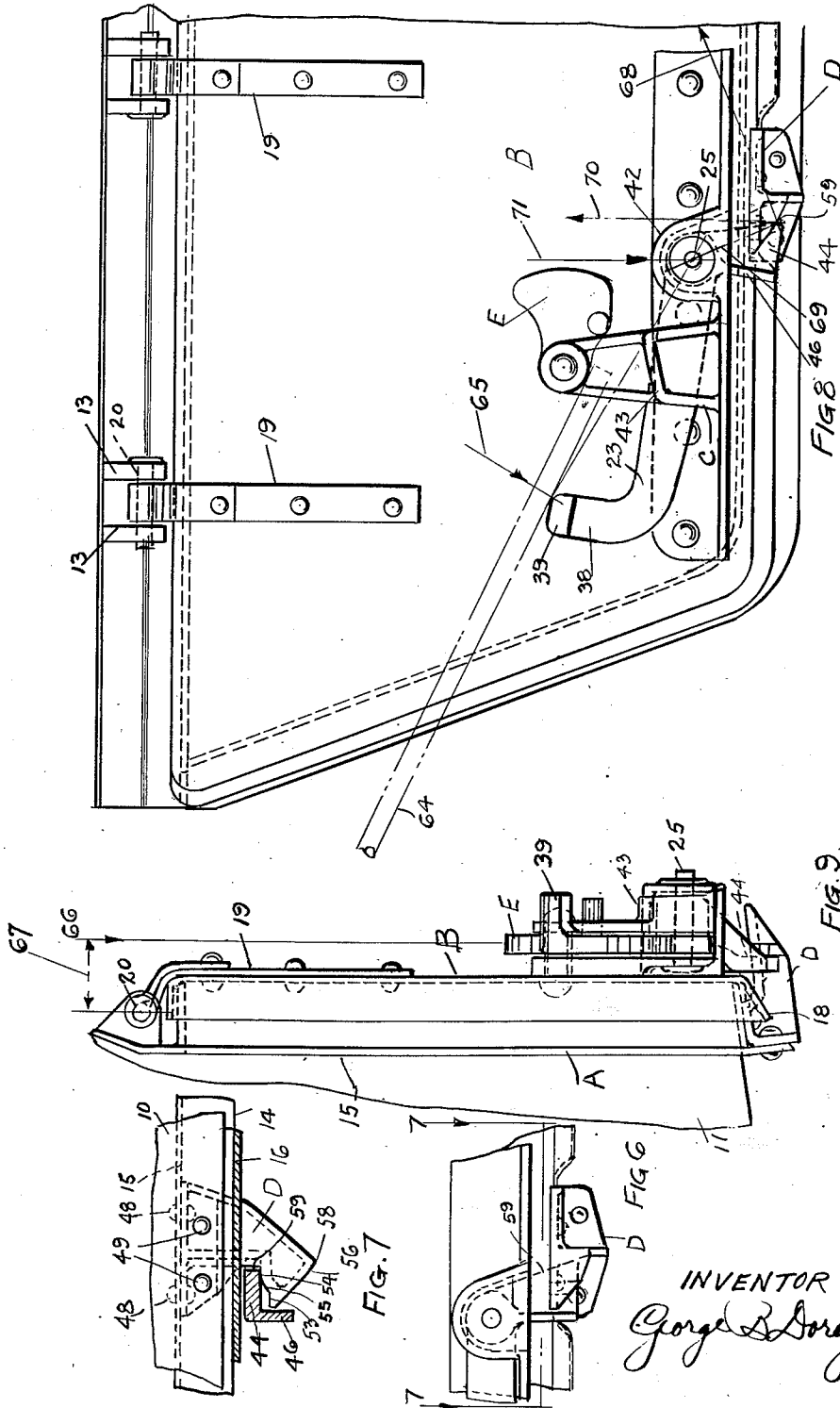
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2 SHEETS—SHEET 2



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HOPPER CAR DOOR LATCHING MEANS

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My invention relates to improvements in hopper car door latching means.

One of the objects of my invention is to provide an improved door latching means applicable to the discharge doors of railway hopper cars and the like and is especially related to that type of door in which the latching means are disposed centrally of the door and where the clearance limitations have to be considered.

A specific object of my invention is to provide a latch of the bell crank type which will be pivotally mounted on the door and wherein one arm will extend towards the swinging edge of the door for co-operation with a shouldered keeper and wherein the other arm will constitute the operating handle for the latch.

My invention further resides in the particular construction and mounting of the latch and in its relation with associated parts whereby a simple and rugged construction is obtained.

In the drawings forming a part of this specification, Fig. 1 is a vertical, sectional view of a portion of a so-called W-type hopper car taken transversely of the car, and showing in elevation with the door in the open position my improved construction in connection therewith. Fig. 2 is a vertical, elevational side view of the structure illustrated in Fig. 1, as viewed from left to right. Fig. 3 is a fractional plan view of the hopper bottom wall showing as much as necessary of the car structure to indicate the shouldered keeper and associated car construction, said view being taken on a line 3—3 of Fig. 2. Fig. 4 is a sectional plan view taken through the door and on a line corresponding substantially to a line 4—4 of Fig. 1. Fig. 5 is an enlarged vertical transverse sectional view taken through the door and on a line corresponding substantially to a line 5—5 of Fig. 1.

Fig. 6 is a fragmentary vertical frontal view of the lower portion of the door and frame with the latch in latching relation with the keeper, said view being taken as a direct frontal view of the door and latching mechanism.

Fig. 7 is a sectional plan view taken through the latch and on a line 7—7 of Fig. 6.

Fig. 8 is a view showing the frame and door in frontal elevation with the door in closed and latched position.

Fig. 9 is a vertical end view of the structure shown in Fig. 8.

In said drawings I have shown only so much of a door and associated car structure as necessary to illustrate my improvements in connection therewith but it will be understood that

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the latching means may be applied to any type of door. In the particular embodiment shown on the drawings the latching means is shown as applied to a so-called unit door where the latching means is located centrally of the door and the door is of comparatively small length and easily kicked or swung to closed position.

In the drawings 10 denotes the sloping bottom wall of the hopper and 11 the outer side wall, it being understood that another side wall (not shown) is usually employed to form the hopper and define the door opening.

Extending around the bottom and side walls of the hopper is a frame A which operates to reinforce the walls adjacent the door opening and also provide a suitable structure for supporting the discharge door B. Said hopper frame A is provided with a top horizontally disposed beam member 12 having hinge butts 13—13 for supporting the door, the lower portion of the frame which depends from the ends of the horizontal member consists of a structural steel member which in this instance is indicated as formed of angularly related walls indicated at 14 and 15, said wall 14 overlying the hopper walls and said wall 15 outstanding from said hopper walls to provide strength and rigidity against warping or bending of the structure around the opening of the door.

The door B in its preferred form is shown as including a body plate portion 16 with upturned marginal flanges 17 and 18 to form a pan shaped member. The flange 18 which extends along the front marginal edge of the door flares outwardly from the main body plate at an obtuse angle in order to provide a load shedding plane when the said door is in open position. Hinge straps 19—19 are secured to the outer side of the door and the door is supported thereby from hinge butts 13 through the medium of pins 20. The door when in closed position is adapted to abut the sloping floor and the upstanding flange 18 then extends beneath the sloping hopper floor.

The door is adapted to be kicked or swung to closed position and locking means are provided to automatically retain the door in a partially closed position as said door approaches its final closed position. The locking means includes mechanism carried by the door and indicated at C and a co-operating latching keeper carried by the hopper and indicated at D.

The latching means C includes a bell crank lever 21 having a downwardly projecting arm 22 and a laterally extending arm 23. The latch at the junction of the respective arms is provided

with a hub portion 24 of extended length and extending through said hub is the pivot 25 whereby the latch is pivotally supported on the door to swing in a plane substantially parallel with the body of the door. The latch is mounted on a beam member 26 which includes a body portion of angle shape with one wall 27 disposed flatwise against the door and secured thereto by rivets 28 and having the other wall 29 outstanding from said first named wall. The beam member is provided with a housing portion 30 for receiving the hub 24 of the latch and providing mounting walls for the pivot 25. Said mounting walls are shown as at 31 and 32 and connected by transversely extending wall means 33 which extend between said respective walls and at the top of the housing extend in the form of a hood of arcuate shape 34 around the top part of the hub. The inner wall 32 of the mounting walls is formed with a chambered recess 32a in which the head 35 of the pivot 25 is confined.

As will be noted, the hub portion of the latch is disposed between the inner and outer walls of the housing and the downwardly extending arm 22 extends through the open bottom 36 of the housing section. In effect the transverse wall means of the housing may be considered as a continuation of the outstanding wall 29 contoured to extend above and around the hub of the latch. An opening 37 is disposed in one side of the transversely extending wall means for the accommodation of the laterally extending arm 23.

On each side of the housing portion 30, the beam member is extended lengthwise to provide for reinforcement of the door and support the end portions of the door which overhang on each side of the latch support. The laterally extending arm 23 of the latch member is deflected upwardly as indicated at 38 and at an appreciable distance above the pivotal axis of the latch an outwardly extending projection 39 is provided at the upper portion of the part 38 for the purpose of providing a fulcrum for a removable operating bar. Intermediate the pivot 25 and the outer end of the latch, spaced guiding walls 40 and 41 are formed on the beam member and the latch arm 23 is movable between said guides. A pivotally mounted locking cam E is disposed between said walls 40 and 41 for locking the bell crank lever in operative latching position.

In levering the latch to open position through the use of a removable bar the outer surface 42 of the arcuate shaped portion of the housing constitutes one of the fulcrums on which the bar may rest to lift the latch in co-operation with the projection 39 of the latch. A second fulcrum or levering location for a removable bar is provided in the form of an outstanding ledge 43 disposed on the outer side of wall 41, said ledge 43 by reason of its more immediate adjacency to fulcrum 39 can be used instead of fulcrum 42 where great leverage is required as during initiation of the latch releasing movement.

The downwardly projecting arm 22 of the latch includes a comparatively narrow latching wall 44 which leads downwardly from the hub 24 and is directed inwardly and downwardly as at 45 to lie below the wall 32 of the housing and swing substantially in the plane parallel to the plane of the door. Said latching wall 44 is braced relatively to the hub by a wall 46 which is angularly disposed relatively to the locking wall and preferably at right angle thereto, said bracing wall being extended lengthwise of the hub for substantially the entire length thereof. The em-

ployment of an extended length of hub in combination with the rigid integrally formed bracing means employed to back up the latching wall 44 provides for a swinging bracket effect for sustaining the load and transmitting the same directly to pivot 25.

The shouldered keeper D consists of a member having a bracket attaching portion 47 lying in the angle presented by the angularly related walls 14 and 15 of the frame and secured thereto by rivets 48 and 49. The said keeper extends outwardly beyond the frame and beyond the sloping floor with a shank portion 50 presenting an upper wall surface 51 spaced downwardly from the floor to provide a recess 52 within which the flange 18 of the door is adapted to extend when the door is in closed position. Said shank portion 50 is formed with a two step shoulder as at 53 and 54, said respective shoulders being connected by an inclined wall 55 whereby the arm 22 of the latch will first engage step 53 and thereafter slide along surface 55 to wedge the door to closed position.

Outwardly of the shoulder the keeper is formed with a forwardly projecting extension tapering in two directions as indicated at 56 and 57 respectively, said tapering lines converging into a pointed tip 58. Said surface 56 as the door is moved to closed position engages the edge surface 59 of the arm 22 to displace said latch by movement of the door until the step 53 is engaged and the door temporarily held in a nearly closed position.

The flange 18 at a location in alignment with the shank portion 50 of the keeper is crimped as indicated at 60 by deflecting a section of door flange to present an indented section 61 adapted to straddle the keeper when the door is in closed position, said indented portion of the flange being of reduced depth as compared with the main part of the said flange, said flange section 61 being disposed at a sharper angle relatively to the body of the door than the main flange.

In my improved construction the pivot 25 of the bellcrank latch is disposed between the shoulder engaging portion of the latch and the operating end of said latch thus providing a unit of comparatively small proportions and consequently light in weight and low in cost. In a structure involving a door which is swung manually to closed position, it is of importance that the weight of the latching mechanism be reduced to a minimum in order to facilitate the door closing operation.

A further advantage derived from the offset pivot construction resides in the upward movement of the latch arm 22 as it approaches the locking shoulder of the keeper inasmuch as the upward swing of the latch as indicated by arc 62 provides for a generous area of contact between the latching faces without unduly extending the latch in the swinging clearance of the door. The matter of clearances in hopper cars is of importance inasmuch as the parts of the hopper are set as low as possible in order to obtain maximum loading capacity and it is usual for the door in its open position to define the height at which the hopper should be set above the rail. In carrying out my improvements I have therefore placed the latching mechanism within the swinging clearance of the door as indicated by arc 63.

In view of the circumscribed area in which the latch on the door may be placed it will be ap-

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preciated that the extent of latch projecting beyond the body of the door will be restricted and in order to compensate for such restricted length of latch I extend the main bearing shoulder 54 beyond the normal latching position in order that the latching face of arm 22 will sweep along the extended portion of the shoulder during the releasing operation of the latch.

The fact that the downward sweep of the lever arm 22 contacts the extended portion of the shoulder during latch release operates in the nature of a secondary lock as the frictional contact between the locking faces operates as a deterring factor and counteracts the tendency for the latch arm to jar upwardly when shunting cars or passing over uneven tracks or switches. It is usual to place cars in tipples and unload by turning the tipples sideways and under such circumstances the locking cam may become released and it is therefore desirable that a secure lock should be obtained independently of the locking cam.

The operation of the latch is simple. Assuming that the door is in closed position, the operator first releases the locking cam swinging the same to an overbalanced position and next inserts a removable bar between fulcrums on the door and latch respectively and by a lifting movement of the bar swings the latch arm 22 clear of the shoulder of the keeper thereby releasing the door and permitting the same to open by its weight. The closing operation is accomplished by swinging the door in a closing direction, the latch being maintained in a normal locking position by the weight of the arm 23, and as contact is established between the arm 22 of the latch and the beveled portion of the keeper the said arm 22 is displaced and engages with the shoulder 53 retaining the door in partly closed position. The operator then bears down on the end of the arm 22 and forces the door to fully closed position by reason of the wedging action of arm 22 along the face 55 as will be understood. The locking cam E is then swung into the path of the arm 23.

The function of the offset pivot for the bell-crank latch will be best appreciated by reference to Fig. 8 wherein the latch is shown with the latching arm 44 leaving the beveled runway 55 to engage with the main latching seat 54. The latch as shown indicates the manner in which the latch is forced home by a removable operating bar as indicated at 64. With the locking cam E in overbalanced released position the operating bar is inserted between the said cam E and the upper face of projection 39 of the latch to bear down on the latch in the direction indicated at 65. The downward force exerted is as shown in Fig. 9 on a line 66 spaced appreciably outwardly from the pivotal axis of the door as indicated at 67 and substantially in alignment with the arm 23. It, therefore, follows that a downward pressure acting on the door outwardly of the pivotal axis of the door and outwardly of the main body of the door operates to move the door towards closed position. The downward force so exerted is further augmented by reason of my novel arrangement of offset pivot which provides, during the door closing operation, for movement of the latch arm 44 in a sidewise and upwards direction to engage with the shoulder of the keeper. The resultant action may be understood by following the sequence of the door closing operation as follows. The door is swung to closed position and the

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latch displaced by contact between the co-operating surfaces 59 and 56 on the latch and keeper respectively to engage with shoulder 53 and the door thereby retained in partly closed position. The operator then bears down on the outer end of the bar causing the latch arm 44 to hug along the inclined plane 55 of the keeper to finally engage with shoulder 54. In the course of this operation the latch and keeper are disposed in wedging relation, and the resistance developed from such wedging results in a sideways and upward thrust on a line 68 normal to the line of effective leverage indicated at 69. The direction of thrust as indicated by line 68 being sideways and upwards is resolved in an upward thrust against the keeper as indicated by line 70 with a corresponding downward pull on the door as indicated by line 71. The fact that this downward pull is exerted at an appreciable distance outwardly of the pivotal axis of the door as indicated by line 66 thus assists in the closing operation of the door by providing that the application of power to force the latch to wedging position will also operate as a pushing force to swing the door towards closed position.

What I claim is:

1. In a railway car, the combination with means forming a hopper having a discharge opening including a sloping floor and a discharge door pivotally mounted adjacent the upper part of the opening, said door when in closed position being adapted to meet the lower edge of said sloping floor; of cooperating latching means on the door and hopper respectively, said latching means on the door including a bell crank lever pivotally mounted on the door to swing in a plane parallel to the plane of the door and said latching means on the hopper including a shouldered keeper mounted beneath the sloping floor and having the shouldered portion lying beyond the lower edge of the sloping floor; said keeper being disposed centrally of the door and said bell crank having a downwardly extending arm engaging with the shoulder of said keeper to hold the door closed; said bell crank having its pivotal axis located above and offset laterally from said shoulder of said keeper on the side of the entrance thereto when said door is closed whereby, while said bell crank lever is being swung from latching to unlatching position, said downwardly extending arm moves sideways and downwardly relative to said shoulder and the frictional engagement therebetween results in an upward thrust tending to open the door and whereby, while said bell crank lever is being swung to latching position, said downwardly extending arm moves sideways and upwardly relative to said shoulder and the frictional engagement therebetween results in a downward thrust tending to close the door; and said bell crank having an arm extending laterally outwardly from its pivot toward one of the sides of the door.

2. In a railway car, the combination with means forming a hopper having a discharge opening including a sloping floor and a discharge door pivotally mounted adjacent the upper part of the opening, said door when in closed position being adapted to meet the edge of the sloping floor; cooperating latching means on the door and hopper respectively, said means on the door including a bell crank lever mounted on the door to swing in a plane substantially parallel with the plane of the door and said

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locking means on the hopper including a shouldered keeper mounted centrally of the discharge opening beneath the sloping floor and having the shouldered portion lying beyond the edge of the sloping floor; said shouldered portion of the keeper having: a stepped shouldered portion including a main locking shoulder for retaining the door in fully closed position, a secondary shoulder spaced from said main shoulder for retaining the door in partially closed position, and a connecting wall extending at an incline between said respective shoulders; said latch having a downwardly extending portion engaging with the shouldered portion of the keeper, said latch being spaced outwardly from the main body of the door and from the pivotal axis of the latter, the pivotal axis of said latch being located on said door above and spaced laterally away from said inclined connecting wall between said shoulders of the keeper when said door is closed whereby, while said door is being closed, the downwardly extending portion of the latch moves sideways and upwardly to engage successively said secondary shoulder, said in-

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clined connecting wall and finally said main locking shoulder, thereby wedging said door to closed position and simultaneously exerting a downward pull on said door away from its pivot mounting as a result of frictional engagement between said downwardly extending portion of said latch and said shoulders and said inclined connecting wall and also the wedging action between said downwardly extending portion of said latch and said inclined connecting wall.

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